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Recipient: RESEARCH FOUNDATION OF THE CITY UNIVERSITY OF NEW YORK

Initial Amendment Date: February 17, 2017

Latest Amendment Date: February 17, 2017

Award Number: 1644948

Award Instrument: Standard Grant

Program Manager: Karen Keene
DUE Division Of Undergraduate Education
EHR Direct For Education and Human Resources

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Total Awarded Amount to Date: \$103,020.00

Funds Obligated to Date: FY 2017 = \$103,020.00

History of Investigator: Sarah Hoiland (Principal Investigator)
shoiland@hostos.cuny.edu

Recipient Sponsored Research Office: CUNY Hostos Community College
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Sponsor Congressional District: 15

Primary Place of Performance: CUNY Hostos Community College
500 Grand Concourse
Bronx
NY US 10451-5307

Primary Place of Performance Congressional District: 15

Unique Entity Identifier (UEI):

Parent UEI:

NSF Program(s): IUSE

Primary Program Source: 040106 NSF Education & Human Resource

Program Reference Code(s): 7916, 8209, 8238, 9178

Program Element Code(s): 1998

Award Agency Code: 4900

Fund Agency Code: 4900

Assistance Listing Number(s): 47.076

ABSTRACT

Quantitative reasoning (QR), the contextualized use of numbers and data in a way that involves critical thinking skills, is essential for informed decision making, career advancement, and full participation in civic life. Most students do not have sufficient opportunities to learn the QR skills needed for personal and professional success, and this disadvantage is particularly acute among students from underrepresented minority populations. In response to this need, two Hispanic-Serving Institutions (HSIs), Hostos Community College and Lehman College will implement a professional development (PD) project, Numeracy Infusion for College Educators (NICE), for 24 faculty in those two institutions along with Bronx Community College faculty (also an HSI). The project will build on prior work in which faculty members learned how to infuse QR into courses ranging from biology, chemistry, and mathematics, to African and African-American studies, history, and political science.

Over the course of the project, faculty volunteers will participate either in an intensive 10-week summer program or in a 10-month program offered during the academic year. The NICE project will teach faculty how to (a) apply QR within the context of their subject areas, (b) articulate QR learning goals and objectives, (c) incorporate best practices for teaching QR, (d) adapt and implement strategies for infusing QR into course instruction, and (e) assess the effectiveness of QR initiatives. The same progressive teaching methods that have proven effective in undergraduate QR instruction will be used to teach faculty within the NICE program; specifically, faculty will engage in active and collaborative learning using real-world data. Toward establishing an adaptable model for faculty PD in QR that offers a comparison between an extended academic year experience and a more intense summer-only experience, the project team will focus on three key research questions: (1) How does the NICE program enhance the QR teaching abilities of faculty? (2) How does the NICE program impact faculty efforts to infuse QR into their course instruction?; and (3) How does faculty participation in NICE translate into real QR learning gains among CUNY students?

PROJECT OUTCOMES REPORT

Disclaimer

This Project Outcomes Report for the General Public is displayed verbatim as submitted by the Principal Investigator (PI) for this award. Any opinions, findings, and conclusions or recommendations expressed in this Report are those of the PI and do not necessarily reflect the views of the National Science Foundation; NSF has not approved or endorsed its content.

Numeracy Infusion for College Educators (NICE), a collaborative research project between City University of New York's Lehman College and Eugenio Maria de Hostos Community College, in collaboration with Bronx Community College, provided professional development to faculty from diverse disciplines at each of the Bronx Hispanic-Serving Institutions. The intensive, multi-modal course, adapted from NSF-funded Numeracy Infusion Course for Higher Educations (NICHE) DUE #1121844, utilized a Learning Management System (LMS) to house and modularize reading materials and videos, online discussions, and the course deliverables. Faculty participants received detailed feedback from the NICE Team including the PIs, external evaluator, and senior personnel, and structured peer feedback from other NICE participants.

The pedagogical goals of NICE included: instruction in best practices for quantitative reasoning (QR) instruction, the development of high quality instructional materials (including QR learning goals, QR assignments, and QR assessments), infusing QR into a wide range of disciplines, and increasing faculty comfort in teaching QR including strengthening faculty participants' QR skills (if necessary).

Twenty-eight faculty from participating institutions attended the kickoff workshops and 26 enrolled in two NICE cohorts, one summer intensive cohort and one academic year cohort, and engaged in a variety of best practices in QR instruction throughout the eight modules of the online course delivery. Twenty-one participants completed all or the majority of key deliverables and represented nearly as many distinct disciplines ranging from Allied Health to English to Office Technology to

Physics (to name just a few), surpassing our goal of 20 faculty participants and wide disciplinary focus.

NICE participants and several NICHE participants came together at Hostos Community College for our NICE Capstone Conference; they presented their instructional materials and assessment data, presented posters with assessment data, and listened to Lehman and Hostos students who took numeracy-infused courses. The in-person workshops that kicked off each cohort, the collaborative nature of the online course delivery, and the capstone conference helped us to achieve the goal of establishing a network of faculty across CUNY who infuse numeracy in their courses. The capstone conference and faculty reflections on their assessment results provided insight into learning gains among CUNY students with respect to QR/QL learning goals in numeracy-infused courses. The student demographics at each institution are predominantly underrepresented minorities in STEM and the majority of our faculty participants identified as female (21/26) and approximately half identify as racial/ ethnic minorities; therefore, NICE doubly benefits undergraduate education by providing professional development to diverse faculty who teach underrepresented students in both STEM and non-STEM courses.

The PIs and NICE faculty participants made over a dozen conference presentations. Some of the ripple effects of the NICE Program are yet to be fully realized, but one participating institution has added QR as an institutional learning outcome and linked it directly to the institutional mission. Future publications will disseminate research findings related to the effectiveness of delivery by comparing the summer cohort and academic year cohort and the collaboration between four- and two-year institutions, both of which will contribute to best practices for faculty development and collaboration.

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NSF Org:	DUE Division Of Undergraduate Education
Recipient:	RESEARCH FOUNDATION OF THE CITY UNIVERSITY OF NEW YORK
Initial Amendment Date:	February 17, 2017
Latest Amendment Date:	February 17, 2017
Award Number:	1644975
Award Instrument:	Standard Grant
Program Manager:	Sandra Richardson srichard@nsf.gov (703)292-4657 DUE Division Of Undergraduate Education EHR Direct For Education and Human Resources
Start Date:	January 1, 2017
End Date:	December 31, 2020 (Estimated)
Total Intended Award Amount:	\$196,978.00
Total Awarded Amount to Date:	\$196,978.00
Funds Obligated to Date:	FY 2017 = \$196,978.00
History of Investigator:	Esther Wilder (Principal Investigator) Esther.Wilder@lehman.cuny.edu
Recipient Sponsored Research Office:	Research Foundation Of The City University Of New York (Lehman) 250 BEDFORD PARK BLVD BRONX NY US 10468-2524 (718)960-8107
Sponsor Congressional District:	13
Primary Place of Performance:	Hostos Community College 500 Grand Concourse Bronx NY US 10451-5323
Primary Place of Performance Congressional District:	15
Unique Entity Identifier (UEI):	DJ4SM8UQBHT7
Parent UEI:	U7WPB7AFN7M2
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PUBLICATIONS PRODUCED AS A RESULT OF THIS RESEARCH

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Wang, Frank "Using COVID-19 Vaccine Efficacy Data to Teach One-Sample Hypothesis Testing" *Numeracy* , v.14 , 2020 <https://doi.org/10.5038/1936-4660.14.1.1383> [Citation Details](#)

PROJECT OUTCOMES REPORT

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The Numeracy Infusion for College Educators (NICE) project facilitated the infusion of quantitative reasoning (QR) instruction and assessment into undergraduate courses at the City University of New York's (CUNY's) three Hispanic-Serving Institutions (HSIs) in the Bronx: Bronx Community College, Hostos Community College, and Lehman College. The program provided training in best practices for QR instruction to approximately two dozen faculty in a wide range of disciplines (e.g., astronomy, chemistry, education, English, mathematics, nursing, and sociology), teaching instructors how to (a) apply QR within a disciplinary context, (b) articulate QR learning goals and

objectives, (c) incorporate best practices for teaching QR, (d) adapt and implement strategies for infusing QR into course instruction, and (e) assess the effectiveness of QR initiatives in order to further improve the quality of undergraduate teaching. NICE also fostered the development of a community of practice across the three institutions. CUNY faculty interested in QR can now rely on support not just from the NICE project team, but from many of the faculty who participated in the program.

Participating faculty enrolled in either an online summer program or an academic-year program. Although NICE is chiefly an online course, each instruction program began with a two-day in-person session in which faculty got acquainted with one another and discussed QR pedagogy. During these sessions, faculty also participated in an assessment activity and discussed the meaning and relevance of QR, with special emphasis on the required reading, Jeffrey Bennett's classic book MATH FOR LIFE.

The online component of NICE consisted of eight units: (1) QR and Making Numbers Meaningful; (2) QR Learning Outcomes; (3) The Brain, Cognition and QR; (4) QR and Writing; (5) Discovery Methods; (6) Representations of Data; (7) QR Assessment; and (8) QR Stereotypes and Culture. Each unit included a set of readings, videos, hands-on activities, and interactive discussions. In addition, participating faculty completed several key tasks—activities and assignments in which they developed materials for their own courses—and collaboratively assessed the work completed by their peers.

The NICE instruction program adopted many of the same progressive teaching methods that have proven effective in undergraduate QR instruction. Faculty engaged in active and collaborative learning using real-world data, reviewed samples of students' work, evaluated QR assessment instruments, and reviewed a variety of online resources that can be used to engage students and others in meaningful data analysis projects.

The network of CUNY faculty devoted to QR instruction has grown over the course of the project, and the 2018 QR Pedagogy Capstone Conference attracted more than 50 faculty from across CUNY.

Our research on the NICE project has focused on three key questions: (1) To what extent does the NICE program enhance the QR teaching abilities of faculty? (2) How has it influenced the faculty's efforts to infuse QR into their course instruction? and (3) Has faculty participation in NICE led to QR learning gains among CUNY students? We have also compared the effectiveness of the summer and academic-year programs. Our analyses show that faculty who enrolled in the program during the summer were not only more likely to complete the program, but to complete it in a timely fashion. Surveys and skills assessment administered at the beginning and end of each instruction program demonstrate that NICE is effective in enhancing the capabilities of participating faculty and in promoting a strong commitment to QR instruction. For example, 94% of faculty agreed that their NICE participation had made them more familiar with new strategies and tools for teaching QR. The student assessment data, gathered independently by faculty participants, reveal meaningful gains in students' QR skills as well as their comfort with data analysis and related tasks.

The Bronx is New York's poorest borough, and Bronx CUNY students are overwhelmingly minority, female, and economically and academically disadvantaged. By training more than two dozen faculty, NICE has improved the educational experiences of thousands of students. NICE has also helped faculty beyond CUNY as a result of our dissemination activities. The instructional materials from the project are readily available on the NICE website (www.teachqr.org), which also includes resources on best practices and tools for engaging students in data analysis. Moreover, our research on NICE—both existing publications/presentations and those in progress—contributes to our understanding of best practices for faculty development.

Finally, we have worked to ensure that the NICE materials and evaluation results are widely available to educators, policymakers, administrators, and researchers. These efforts have included more than a dozen presentations, workshops, and scholarly papers.

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Modified by: Esther I Wilder

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